ADJUSTABLE VENT

Technical Field

[0001] The invention pertains to vents. Particular embodiments of the invention relate to adjustable vents which may be mounted on building surfaces.

Background

[0002] Many buildings have vents which provide routes for exchange, ventilation, circulation and/or movement of air through the surfaces (eg. walls and ceilings) of the building. Buildings may have ventilation systems, which take in "fresh" air from outside of the building and expel "stale" air from inside the building. Fresh air may be taken into a building or stale air may be expelled from a building through one or more vents. Some buildings incorporate other systems and/or apparatus, such as air conditioning systems, heating systems and bathroom fans, which use vents to provide routes for the movement of air through building surfaces.

[0003] Typically, a vent is associated with a conduit which conveys air towards or away from the vent. A vent provides a vent passageway in fluid communication with its associated conduit to provide a means for air flow through a building surface. Vents may provide a number of additional functions. For example, vents may comprise features for preventing debris from entering their associated conduits or for providing a more aesthetically pleasing terminus for their associated conduits.

[0004] There are many vent designs known in the art. For example:

- United States Patent No. 6,520,852 (McKee et al.) discloses a vent with a perimeter flange having a nailing means made of a material with a low coefficient of thermal expansion, such as aluminum. The vent further includes a grill structure and a cap. The cap, which is made from dent resistant plastic, is preferably molded to the nailing means;
- United States Patent No. 5,6435081 (Klein) describes a vent screen and vent, which include a vent duct, an exterior grill connected to one end of the vent duct, and a vent screen support assembly connected between the vent duct and the exterior grill; and
- United States Patent No. 6,682,415 (Vagedes) discloses a replacement dryer vent which includes a typical exterior vent portion and an interior tube portion. The tube portion extends into a building and has an internal diameter that increases toward its innermost edge (i.e. toward the interior of the building), such that the tube portion slips over the existing cylindrical duct already in the wall.

[0005] Vents typically comprise a flange or the like, which allows the vent to be mounted to a building surface using fasteners that project through the flange and into the building surface. Exposed fasteners used for this purpose may make the vent aesthetically unattractive. Exposed fasteners may also be susceptible to oxidation or similar consequences of being exposed to the environment.

[0006] Some vents comprise flow adjustment mechanisms. Such mechanisms allow the flow of air through the vent to be controlled. Because of frequent use and the associated wear, flow adjustment mechanisms used in vents often malfunction or break. Accordingly, there is a general desire to provide vents with flow adjustment mechanisms that are robust and relatively immune to breakage. Vents incorporating such robust flow adjustment mechanisms typically require that the flow adjustment mechanisms and their associated components are relatively large to provide the flow adjustment mechanisms with sufficient strength.

[0007] One drawback with such robust flow adjustment mechanisms is that the maximum rate of air flow through a vent and its conduit will typically be limited by the cross-sectional area of the conduit and/or the vent. Robust and correspondingly large flow adjustment mechanisms tend to occupy a larger portion of the vent and to impede the flow of air through the vent.

[0008] There is a need for vents which have relatively robust and strong flow adjustment mechanisms that do not unnecessarily impede the flow of air through the vent. There is also a need for vents which are attractive looking.

Summary of the Invention

[0009] A first aspect of the invention provides a vent which comprises a body member and an adjustment member. The body member comprises a vent passageway that extends from an inward side to an outward side of the body member. The body member also comprises a collar having a collar passageway that extends from an inward side to an outward side of the collar. The collar passageway is in fluid communication with the vent passageway. The adjustment

member comprises a head disposed to adjustably restrict a flow of air through the vent passageway and a stem. The stem, which may project inwardly from the head, has one or more stem portions. The one or more stem portions comprise one or more contact portions which engage an interior surface of the collar and which moveably couple the adjustment member to the body member. The one or more stem portions, alone or in combination with the interior surface of the collar, define one or more collar openings that extend through the collar passageway.

[0010] A position of the adjustment member may be adjustable relative to the body member to adjustably restrict the flow of air through the vent passageway. At least a portion of the flow of air through the vent passageway may flow through the one or more collar openings. One or more of the collar opening(s) may be defined between at least one stem portion and the interior surface of the collar. One or more of the collar opening(s) may be defined between a plurality of stem portions.

[0011] Inward movement of the adjustment member relative to the body member may decrease a size of an opening through which air may flow into and out of the vent passageway. Conversely, outward movement of the adjustment member relative to the body member may increase the size of the opening through which air may flow into and out of the vent passageway.

[0012] The one or more stem portions may have a wide variety of configurations. The one or more stem portions may comprise one or more blades and the one or more contact portions may comprise a plurality of contact portions that engage the interior surface of the collar at spaced-apart locations. The one or more blades may comprise a

plurality of blades which extend radially in angularly spaced-apart directions. The angularly spaced-apart directions may be equally spaced from one another. The one or more blades may have different configurations. Each collar opening may be defined between two or more blades and/or between one or more blades and the interior surface of the collar.

[0013] The interior surface of the collar may be generally circular in cross-section and may comprise one or more helical threads. The one or more contact portions may comprise at least one contact portion that has one or more indents for engaging the one or more helical threads. Rotating the adjustment member relative to the body member in a first angular direction may cause corresponding inward movement of the adjustment member relative to the body member and a corresponding decrease in a size of an opening through which air may flow into and out of the vent passageway. Conversely, rotating the adjustment member relative to the body member in a second angular direction may cause corresponding outward movement of the adjustment member relative to the body member and a corresponding increase in the size of the opening through which air may flow into and out of the vent passageway.

[0014] The one or more contact portions may slidably frictionally engage the interior surface of the collar. The one or more stem portions may comprise one or more contact portions that abut against the interior surface of the collar to form a slidable friction fit therewith. The interior surface of the collar may comprise one or more inwardly extending grooves and the one or more contact portions may comprise at least one contact portion that is slidably received in each of the grooves. The interior surface of the collar may comprise one or more projections and

the one or more contact portions may comprise at least one inwardly extending groove which slidably receives the one or more projections.

[0015] The body member may comprise one or more brackets for supporting the collar in the vent passageway.

[0016] The vent may comprise one or more intermediate members that may be coupled between the body member and the adjustment member. Each intermediate member may comprise an intermediate vent passageway that extends from an inward side to an outward side of the intermediate member and an intermediate member collar having an intermediate collar passageway that extends from an inward side to an outward side of the intermediate member collar. Each intermediate collar passageway may be in fluid communication with the intermediate vent passageway. Preferably, at least a portion of each intermediate member collar is supported in its corresponding intermediate vent passageway. The one or more contact portions of the adjustment member may engage an interior surface of each intermediate member collar and may adjustably couple each intermediate member between the adjustment member and the body member. The one or more stem portions, alone or in combination with the interior surface of each intermediate member collar, may define one or more intermediate collar openings that extend through each intermediate collar passageway.

[0017] Air passing through the vent passageway may flow inwardly and/or outwardly through the intermediate collar openings. Each intermediate member may move inwardly and outwardly relative to the body member and/or the adjustment member to decrease or increase the size of the openings through which air may flow into and out of the vent passageway and each corresponding intermediate vent passageway.

[0018] One or more of the intermediate collar opening(s) may be defined between at least one stem portion and the interior surface of the intermediate member collar. One or more of the intermediate collar opening(s) may be defined between a plurality of stem portions.

[0019] The interior surface of each intermediate member collar may be generally circular in cross-section and may comprise one or more helical threads. The one or more contact portions may comprise at least one contact portion that has one or more indents for engaging the one or more helical threads. Rotating the adjustment member relative to an intermediate member in a first angular direction may cause corresponding inward movement of the adjustment member relative to the intermediate member and a corresponding decrease in a size of an opening through which air may flow into and out of the intermediate vent passageway and rotating the adjustment member relative to the intermediate member in a second angular direction may cause corresponding outward movement of the adjustment member relative to the intermediate member and a corresponding increase in the size of the opening through which air may flow into and out of the intermediate vent passageway.

[0020] Rotating the intermediate member relative to the body member in a first angular direction may cause corresponding inward movement of the intermediate member relative to the body member and a corresponding decrease in a size of an opening through which air may flow into and out of the vent passageway and rotating the intermediate member relative to the body member in a second angular direction may cause corresponding outward movement of the intermediate member relative to the body member and a corresponding increase in the size of the opening through which air may flow into and out of the vent passageway.

[0021] The body member may comprise a mounting flange for coupling the body member to a building surface. When the vent is mounted to the building surface, a plurality of fasteners may project through the mounting flange and into the building surface. The vent may comprise a trim member that is removably coupleable to the body member. When the trim member is coupled to the body member, the trim member may extend over an outward surface of the mounting flange at a distance spaced outwardly therefrom. The trim member may cover an outward side of any portions of the plurality of fasteners which extend outwardly past the outward surface of the mounting flange. The trim member may be shaped to define a channel and, when the trim member is coupled to the body member, the channel may open inwardly onto the outward surface of the mounting flange such that any portions of the plurality of fasteners which extend outwardly past the outward surface of the mounting flange are located in the channel.

[0022] The vent may comprise a trim member that is removably coupleable to the body member, wherein, when the trim member is coupled to the body member, the trim member covers outward ends of one or more fasteners used to mount the vent to the building surface. The trim member may comprise an interiorly projecting lip and the body member may comprise an exteriorly projecting lip. When the trim member is coupled to the body member, the interiorly projecting lip of the trim member may be received on an inward side of the exteriorly projecting lip of the body member. The trim member may comprise at least one groove and the body member may comprises at least one projection. When the trim member is coupled to the body member, the at least one projection may be received in the at least one groove.

[0023] Another aspect of the invention provides a vent that comprises a body member and an adjustment member. The body member has a vent passageway which extends from an inward side to an outward side of the body member and a surface that defines a bore in fluid communication with the vent passageway. The adjustment member comprises a head and a stem projecting inwardly from the head. The stem comprises a plurality of blades. The exterior edges of the blades are disposed to engage the bore defining surface. The blades, alone or in combination with the bore defining surface, define a plurality of passages through the bore.

[0024] The bore defining surface may comprise one or more helical threads and the exterior edge of at least one of the blades may comprise one or more indents for engaging the one or more threads.

[0025] Another aspect of the invention provides a vent comprising a body member and an adjustment member. The body member comprises a vent passageway that extends from an inward side to an outward side of the body member. The body member also comprises a collar. An interior surface of the collar defines a collar passageway which is in fluid communication with the vent passageway. The adjustment member comprises a head disposed to adjustably restrict a flow of air through the vent passageway and a stem that projects inwardly from the head. The stem has one or more stem portions. The one or more stem portions comprise one or more contact portions which engage an interior surface of the collar and which couple the adjustment member to the body member, such that the stem projects inwardly into the collar passageway and the adjustment member is inwardly and outwardly moveable relative to the body member. The one or more stem portions, alone or in combination with the interior surface of the

collar, define one or more collar openings that extend through the collar passageway for permitting a flow of air through the collar passageway.

[0026] Another aspect of the invention provides a vent. The vent comprises a body member that defines a vent passageway. The vent also comprises a collar that defines a collar passageway. The collar is supported to provide fluid communication between the vent passageway and the collar passageway. The vent also comprises an adjustment member, coupling means for moveably coupling the adjustment member to the collar and passage means for permitting air flow through the collar passageway while the adjustment member is coupled to the collar by the coupling means.

[0027] Further aspects of the invention, features of specific embodiments of the invention and applications of the invention are described below.

Brief Description of the Drawings

[0028] In drawings which depict non-limiting embodiments of the invention:

Figure 1 is an isometric view of an adjustable vent according to a particular embodiment of the invention in a closed configuration;

Figure 1A is an isometric view of the Figure 1 vent in an open configuration;

Figure 2 is an isometric view of the Figure 1 vent from a different perspective;

Figure 3 is an isometric view of a body member of the Figure 1 vent;

Figure 4 is an isometric view of the body member of Figure 3 from a different perspective;

Figure 5 is an isometric view of an adjustment member of the Figure 1 vent;

Figure 6 is an isometric view of an intermediate member of the Figure 1 vent;

Figure 7 is an isometric view of the intermediate member of Figure 6 from a different perspective;

Figure 8 is an isometric view of a trim member of the Figure 1 vent;

Figure 9 is an isometric view of the trim member of Figure 8 from a different perspective;

Figure 10 is a sectioned isometric view of the Figure 1 vent;

Figures 11A and 11B are respectively isometric views of a trim member and a body member of a vent according to another embodiment of the invention;

Figures 12A-12H are schematic partial cross-sectional views of adjustment member stem portions and body member collars of vents according to alternative embodiments of the invention; and

Figure 13 is a cross-sectional view showing one possible mechanism for coupling the trim member of Figure 8 to the body member of Figure 3.

Detailed Description

[0029] Throughout the following description, specific details are set forth in order to provide a more thorough understanding of the invention. However, the invention may be practiced without these particulars. In other instances, well known elements have not been shown or described in detail to avoid unnecessarily obscuring the invention. Accordingly, the specification and drawings are to be regarded in an illustrative, rather than a restrictive, sense.

[0030] Aspects of this invention relate to adjustable vents that can be used to provide passages for air through building surfaces. For example, vents according to the invention may be used for bathroom or kitchen fans, air conditioning ducts, heating ducts or the like.

[0031] Vents according to some embodiments of the invention have a body member comprising a vent passageway that extends from an inward side to an outward side of the body member. Preferably, the body member is mountable to a building surface. The body member also comprises a collar having a collar passageway that extends from an inward side to an outward side of the collar. The collar passageway is in fluid communication with the vent passageway. Preferably, at least a portion of the collar is supported in the vent passageway.

[0032] An adjustment member, which comprises a head disposed to adjustably restrict a flow of air through the vent passageway and a stem. The stem, which may project inwardly from the head, comprises one or more stem portions. The stem portion(s) comprise one or more contact portions which engage an interior surface of the collar and which moveably couple the adjustment member to the body member. The stem portion(s), alone or in combination with the interior surface of the collar, define one or more collar openings that extend through the collar passageway. A position of the adjustment member may be adjustable relative to the body member to adjustably restrict the flow of air through the vent passageway. The collar opening(s) may be defined between two or more stem portions and/or between one or more stem portions and the interior surface of the collar. Air passing through the vent passageway may flow inwardly and/or outwardly through the collar opening(s).

[0033] The adjustable vent may also comprise one or more intermediate members that may be coupled between the body member and the adjustment member. Each intermediate member may comprise an intermediate vent passageway and an intermediate member collar having an intermediate collar passageway. The stem portion(s) of the adjustment member, alone or in combination with the interior surface of the intermediate member collar, also define one or more intermediate collar openings that extend through each intermediate collar passageway. A position of each intermediate member may be inwardly and outwardly adjustable relative to the adjustment member and the body member to increase or decrease the size of the openings through which air may flow into and out of the vent passageway.

[0034] The body member may comprise a mounting flange for coupling the body member to a building surface. The vent may also comprise a trim member, which is coupleable to the body member (or to some other component of the vent). The trim member may cover fasteners used to mount the vent to a building surface. In some embodiments, the trim member extends over at least a portion of an outward surface of the mounting flange at a distance spaced-apart therefrom and covers any portions of the fasteners that extend on the outward side of the mounting flange.

[0035] Figures 1-10 depict a vent **10** according to a particular embodiment of the invention. In most applications, vent **10** is mounted to a building surface **20** (shown in broken lines in Figure 1). Building surface **20** may generally be a ceiling, a wall, a floor or any other building surface and may be in the interior of the building or on the exterior of the building. In the illustrated embodiment, vent **10** comprises a body member **12**, an adjustment member **14**, an optional intermediate member **16** and an optional trim member **18**. Vent **10** is

shown to be generally circular in shape. In alternative embodiments, vents according to the invention may have different shapes. By way of example only, vents according to the invention may be rectangular or partially rectangular and partially circular.

[0036] This description and the accompanying claims use a number of directional conventions to clarify their meaning:

(i) "outward", "outwardly", "outwardmost" and similar words are used to refer to a direction that is generally oriented to extend away from building surface **20** as shown by arrow **22** (Figure 1);

(ii) "inward", "inwardly", "inwardmost" and similar words are used to refer to a direction that is generally oriented toward the inside of building surface **20** as shown by arrow **24** (Figure 1);

(iii) "interior", "interiorly", "interiormost" and similar words are used to refer to directions that are generally oriented toward the symmetrical center of vent **10**, as shown, for example, by arrow **26** (Figure 1); and

(iv) "exterior", "exteriorly", "exteriormost" and similar words are used to refer to directions that are generally oriented away from the symmetrical center of vent **10**, as shown, for example, by arrow **28** (Figure 1).

Those skilled in the art will appreciate that directional terms used in this description and the accompanying claims depend on the specific orientation of vent **10** and building surface **20** to which vent **10** is mounted. Furthermore, as described above, vent **10** need not be circularly symmetric and may have other symmetrical or non-symmetrical shapes. Accordingly, these directional terms are not strictly defined and should not be interpreted literally or narrowly.

[0037] As shown best in Figures 1, 3 and 4, body member **12** comprises a first flange **30** which extends inwardly into building surface **20** (Figure 1). In the illustrated embodiment, an interior surface of first flange **30** defines a vent passageway **32**. Vent passageway **32** is an aperture which extends from an inward side to an outward side of body member **12** to facilitate the passage of air through vent **10**.

[0038] Body member **12** also comprises a collar **44** which defines a collar passageway **47**. Collar passageway **47** extends from an inward side to an outward side of collar **44** and is in fluid communication with vent passageway **32**. In the illustrated embodiment, collar **44** is supported by plurality of angularly spaced-apart brackets **42**, which extend interiorly from an interior surface of first flange **30** into vent passageway **32**. Preferably, at least a portion of collar **44** is located in vent passageway **32**. Brackets **42** are preferably spaced-apart from one another to provide passages **43** (Figure 3), which permit air flow through vent passageway **32**. In the illustrated embodiment, collar **44** is supported by four brackets **42**; however, body member **12** may comprise an alternative number of brackets **42** or any alternative means for supporting collar **44** such that collar passageway **47** is in fluid communication with vent passageway **32**.

[0039] Vent **10** also comprises an adjustment member **14** (shown best in Figure 5), which may be coupled to body member **12** and disposed to adjustably restrict the flow of air through vent passageway **32**. Adjustment member **14** comprises an inwardly extending stem **52** and a generally exteriorly extending head **58**.

[0040] Stem **52** of adjustment member **14** comprises one or more stem portions **53**. Stem portion(s) **53** comprise one or more contact portions **55** which engage the interior surface of collar **44** to adjustably couple adjustment member **14** to body member **12** in a manner that facilitates inward and outward movement of adjustment member **14** relative to body member **12**. Stem portion(s) **53** define one or more collar openings **51** (Figure 2) that extend through collar passageway **47**. Collar opening(s) **51** may be defined between two or more stem portions **53** and/or between one or more stem portions **53** and the interior surface of collar **44**. Air passing through vent **10** may flow inwardly and/or outwardly through collar opening(s) **51**.

[0041] Head **58** of adjustment member **14** extends generally exteriorly from stem **52**. The exterior extension of head **58** tends to restrict the flow of air through the outward end of vent passageway **32**. Inward movement of adjustment member **14** relative to body member **12** causes head **58** to move closer to body member **12**, thereby decreasing the size of the opening through which air may flow into and out of vent passageway **32**. Conversely, outward movement of adjustment member **14** relative to body member **12** causes head **58** to move further from body member **12**, thereby increasing the size of the opening through which air may flow into and out of vent passageway **32**.

[0042] Stem portion(s) **53** of adjustment member **14** may have a wide variety of configurations. The illustrated embodiment of adjustment member **14** comprises a plurality of stem portions **53A**, **53B**, **53C**, **53D** (collectively, stem portions **53**) which, in turn, comprise a plurality of contact portions **55A**, **55B**, **55C**, **55D** (collectively **55**). Contact portions **55** engage the interior surface of collar **44** at spaced-apart locations. Collar openings **51** are defined between pairs of stem

portions **53** and the interior surface of collar **44**. Collar openings **51** extend through collar passageway **47**.

[0043] In the illustrated embodiment, stem portions **53** comprise blades **50A**, **50B**, **50C**, **50D** (collectively **50**), which extend radially at angularly spaced-apart locations. In the embodiment of Figures 1-10, adjustment member **14** comprises four blades **50**, which are symmetrically angularly spaced-apart from one another about axis **60** of stem **52**. Each blade **50** comprises a contact portion **55** at its exterior end. Adjustment member **14** may comprise a different number of blades **50**, which may be angularly spaced-apart from one another by different angular separations that may or may not be symmetric. In some embodiments, one or more of blades **50** do not comprise contact portions **55** (i.e. one or more of blades **50** do not contact the interior surface of collar **44**). In still other embodiments, blades **50** have other configurations.

[0044] Advantageously, stem portions **53**, collar **44** and head **58** provide a robust air flow adjustment mechanism, the components of which may be made sufficiently large and correspondingly strong to be relatively immune from breakage. In addition, the collar openings **51** that extend through collar passageway **47** minimize the blockage of vent passageway **32** by the components of the flow adjustment mechanism, thereby permitting a wide range of air flow through vent passageway **32** and vent **10**. In particular, the presence of collar openings **51** permits the flow of air through collar passageway **47**, such that collar passageway **47** (i.e. the interior of collar **44**) may be an effective part of vent passageway **32**. In some embodiments of the invention, a combined cross-sectional area of collar openings **51** is at least 50% of the cross-sectional area of collar passageway **47**. In other embodiments,

a combined cross-sectional area of collar openings **51** is at least 75% of the cross-sectional area of collar passageway **47**.

[0045] In some embodiments of the invention, the interior surface of collar **44** is generally circular in cross-section and comprises one or more helical threads **48**, thereby defining a threaded bore **46**. In such embodiments, one or more contact portions **55** of stem portion(s) **53** comprise one or more indents **56** for engaging helical thread(s) **48**. In the illustrated embodiment, the contact portion **55** on the exterior end of each blade **50** comprises a plurality of indents **56** for engaging helical thread(s) **48**. In these embodiments, rotating adjustment member **14** relative to body member **12** causes corresponding inward or outward movement of adjustment member **14** relative to body member **12** and a corresponding decrease or increase in the size of the opening through which air may flow through vent passageway **32**.

[0046] In the illustrated embodiment, vent **10** also comprises an optional intermediate member **16**, which is shown best in Figures 6 and 7. Intermediate member **16** may be coupled between adjustment member **14** and body member **12**. Intermediate member **16** comprises a first intermediate flange **70** that defines an intermediate vent passageway **74**. Intermediate vent passageway **74** extends from an inward side to an outward side of intermediate member **16** to facilitate the passage of air therethrough. In the illustrated embodiment, intermediate vent passageway **74** is circular in cross-section. In other embodiments, intermediate vent passageway **74** may have other cross-sectional shapes.

[0047] Intermediate member **16** is preferably positioned such that intermediate vent passageway **74** is in fluid communication with vent passageway **32** of body member **12** (see Figure 2). The cross-sectional areas of first intermediate flange **70** and intermediate vent passageway **74** of intermediate member **16** may be less than the cross-sectional areas of first flange **30** and vent passageway **32** of body member **12**, such that intermediate member **16** can be used to restrict the flow of air through vent **10** as explained further below.

[0048] Intermediate member **16** comprises an intermediate member collar **78** which defines an intermediate collar passageway **81**. Intermediate collar passageway **81** extends from an inward side to an outward side of intermediate member collar **78**. Intermediate collar passageway **81** is in fluid communication with intermediate vent passageway **74**. In the illustrated embodiment, intermediate member collar **78** is supported by a plurality of angularly spaced-apart brackets **76**, which extend interiorly from an interior surface of first intermediate flange **70** into intermediate vent passageway **74**. Preferably, at least a portion of intermediate member collar **78** is located in intermediate vent passageway **74**. Brackets **76** are preferably spaced-apart from one another to provide passages **79** (Figure 6), which permit air flow through intermediate vent passageway **74**. In the illustrated embodiment, intermediate member collar **78** is supported by four brackets **76**; however, intermediate member **16** may comprise an alternative number of brackets **76** or any alternative means for supporting intermediate member collar **78** such that intermediate collar passageway **81** is in fluid communication with intermediate vent passageway **74**.

[0049] Preferably, as shown in the illustrated embodiment, intermediate member **16** is aligned with body member **12**, such that intermediate member collar **78** is aligned with body member collar **44**. Stem **52** of adjustment member **14** may extend inwardly through the interior of both intermediate member collar **78** and body member collar **44**. Contact portion(s) **55** of stem portion(s) **53** of adjustment member **14** may engage the interior surfaces of both intermediate member collar **78** and body member collar **44** to couple intermediate member **16** between body member **12** and adjustment member **14** in a manner which facilitates independent inward and outward movement of intermediate member **16** and adjustment member **14** with respect to body member **12**.

[0050] The one or more stem portions **53** of adjustment member **14** also define one or more intermediate collar openings (not shown in the illustrated views) that extend through intermediate collar passageway **81**. The one or more intermediate collar openings may be defined between two or more stem portions **53** and/or between one or more stem portions **53** and the interior surface of intermediate member collar **78**. Air passing through vent **10** may flow inwardly and/or outwardly through these intermediate collar openings (i.e. through intermediate collar passageway **81**).

[0051] In the illustrated embodiment, both intermediate member **16** and adjustment member **14** may be moved inwardly and outwardly relative to body member **12**. This relative movement between adjustment member **14**, intermediate member **16** and body member **12** determines the size of opening **84** (Figure 1A) between adjustment member **14** and intermediate member **16** and the size of opening **86** (Figure 1A) between intermediate member **16** and body member **12**. Opening **84** permits the flow of air into and out of the outward ends of vent passageway **32** and intermediate vent passageway **74**. Opening **86**

bypasses intermediate vent passageway **74** and permits the flow of air into and out of the outward end of vent passageway **32**.

[0052] Referring to Figure 1A, adjustment member **14** may be independently moved outwardly (or inwardly) relative to both intermediate member **16** and body member **12** to cause a corresponding increase (or decrease) in the size of opening **84**. Similarly, intermediate member **16** may be independently moved relative to both body member **12** and adjustment member **14**. Intermediate member **16** may be moved outwardly (i.e away from body member **12** and toward adjustment member **14**) to cause a corresponding increase in the size of opening **86** and a corresponding decrease in the size of opening **84**. Intermediate member **16** may also be moved inwardly (i.e toward body member **12** and away from adjustment member **14**) to cause a corresponding decrease in the size of opening **86** and a corresponding increase in the size of opening **84**. Intermediate member **16** and adjustment member **14** may also be moved together in an outward (or inward) direction relative to body member **12** to cause a corresponding increase (or decrease) in the size of opening **86**.

[0053] In the illustrated embodiment, the interior surface of intermediate member collar **78** is generally circular in cross-section and comprises one or more helical threads **82**, thereby defining a threaded bore **80**. Preferably, at least the interior surface of intermediate member collar **78** is substantially similar in size to the interior surface of body member collar **44**. In addition, the pattern of thread(s) **82** on the interior surface of intermediate member collar **78** is preferably similar to that of thread(s) **48** on the interior surface of body member collar **44**.

[0054] As discussed above, one or more contact portions **55** of stem portion(s) **53** of adjustment member **14** may comprise one or more indents **56**. Indent(s) **56** may engage helical thread(s) **82** on intermediate member collar **78** and helical thread(s) **48** on body member collar **44**. With this configuration, adjustment member **14** may be independently rotated relative to body member **12** and intermediate member **16** to cause corresponding inward or outward movement of adjustment member **14** relative to body member **12** and intermediate member **16** and a corresponding decrease or increase in the size of opening **84**. Similarly, intermediate member **16** may be independently rotated relative to body member **12** and adjustment member **14** to cause corresponding inward movement of intermediate member **16** relative to body member **12** and adjustment member **14**, a corresponding increase in the size of opening **84** and a corresponding decrease in the size of opening **86**. Intermediate member **16** may also be rotated in the opposite angular direction relative to body member **12** and adjustment member **14** to cause corresponding outward movement of intermediate member **16** relative to body member **12** and adjustment member **14**, a corresponding decrease in the size of opening **84** and a corresponding increase in the size of opening **86**. Intermediate member **16** and adjustment member **14** may also be rotated together relative to body member **12** to cause corresponding inward or outward movement of intermediate member **16** and adjustment member **14** relative to body member **12** and a corresponding decrease or increase in the size of opening **86**.

[0055] In some embodiments of the invention, as shown best in Figures 1-4, the exterior surface of first flange **30** of body member **12** comprises one or more exteriorly extending protrusions **34** and/or interiorly extending indents (not shown), which may be used to couple first flange **30** to the interior wall(s) of a conduit **36** (shown in dotted

outline in Figure 1) located within building surface **20** and/or to retain conduit **36** in fluid communication with vent passageway **32**. In other embodiments, first flange **30** has similar coupling features on its interior surface. In still other embodiments, first flange **30** and vent passageway **32** are located in a position proximate to conduit **36** to facilitate fluid communication therebetween.

[0056] In the illustrated embodiment, the interior surface of first flange **30** and vent passageway **32** are generally circular in cross-section. Those skilled in the art will appreciate that this circular shape merely represents one among many possible shapes of first flange **30**. A particular size and/or shape of first flange **30** may be selected to conform with the size and/or shape of conduit **36**. For example, first flange **30** may be square or rectangular in cross-section.

[0057] In some embodiments of the invention, as shown best in Figures 1, 2 and 3, body member **12** also comprises an exteriorly extending mounting flange **38** which may be used to mount vent **10** to building surface **20**. Preferably, at least a portion of the inward surface of mounting flange **38** extends generally parallel with the plane of building surface **20**. In this manner, first flange **30** may extend inwardly into building surface **20** and mounting flange **38** may abut against building surface **20** for mounting thereto. In the illustrated embodiment, mounting flange **38** comprises a plurality of spaced-apart apertures **40**. Fasteners (not shown) may be inserted through apertures **40**, so as to project through mounting flange **38** and into building surface **20** for mounting vent **10** to building surface **20**. Typical fasteners may include screws, nails, rivets, staples or the like. In some embodiments, apertures **40** are not required and fasteners may be driven directly through mounting flange **38** and into building surface **20**. In other embodiments, adhesive may be used to couple mounting flange **38**

to building surface **20**. In still other embodiments, first flange **30** is used to mount vent **10** to building surface **20** using a friction fit. Such friction fitted embodiments may or may not have a mounting flange **38**.

[0058] In the illustrated embodiment, as shown best in Figure 10, body member **12** comprises a generally "U-shaped" bent portion **88**, which is located around an exterior perimeter of first flange **30** at an outward end thereof. Bent portion **88** connects first flange **30** to exteriorly extending mounting flange **38**. First flange **30** may have different shapes and/or sizes and mounting flange **38** may have different shapes and/or sizes. Accordingly, those skilled in the art will appreciate that bent portion **88** may also have different configurations, depending on the shapes and sizes of first flange **30** and mounting flange **38**. For example, first flange **30** may be circular in cross-section and mounting flange **38** may be rectangular in cross-section. In such an embodiment, bent portion **88** has a different shape to form a transition between first flange **30** and mounting flange **38**. In other embodiments, bent portion **88** is not provided and mounting flange **38** extends directly from an exterior surface of first flange **30**.

[0059] Vent **10** may also comprise an optional trim member **18** (shown best in Figures 8, 9 and 10), which is coupleable to body member **12** (or to some other component of vent **10**). Trim member **18** extends over at least a portion of an outward surface of mounting flange **38** at a distance spaced-apart therefrom. Trim member **18** may be used to cover portions of fasteners that extend on the outward side of mounting flange **38**.

[0060] In the embodiment illustrated in Figures 8, 9 and 10, trim member **18** is generally annular in shape and comprises an inwardly extending portion **92** and a flange portion **96**. Inwardly extending portion **92** of trim member **18** is shaped to conform with an exterior surface of bent portion **88**. Flange portion **96** of trim member **18**

extends generally exteriorly and inwardly from an outward end of inwardly extending portion **92** to form a trim member channel **98**. Trim member channel **98** is located between an interior surface of flange portion **96** and an exterior surface of inwardly extending portion **92**.

[0061] In accordance with one particular embodiment shown best in Figure 13, body member **12** comprises an outwardly projecting rim **21** which may be used to help couple trim member **18** to body member **12**. In the illustrated embodiment, rim **21** extends outwardly from an outer surface of mounting flange **38** and is located at an exterior perimeter of mounting flange **38**. Rim **21** comprises an exteriorly projecting lip **19**. Preferably, exterior projecting lip **19** is shaped to conform with the interior surface of flange portion **96** of trim member **18**. In alternative embodiments, lip **19** may comprise a plurality of spaced apart protrusions rather than a lip extending all of the way around rim **21**. The interior surface of flange portion **96** of trim member **18** comprises a corresponding interiorly projecting lip **17** at an inward end thereof. Preferably, interiorly projecting lip **17** is shaped to conform with an exterior surface of rim **21**.

[0062] With this configuration, trim member **18** may be coupled to body member **12** by pushing trim member **18** inwardly over body member **12**, such that the interiorly projecting lip **17** of trim member **18** is received on an inward side of the exteriorly projecting lip **19** of body member **12**. Interiorly projecting lip **17** then abuts against the exterior surface of rim **21** and exteriorly projecting lip **19** abuts against the interior surface of flange portion **96**. Interiorly projecting lip **17** (and trim member **18**) are secured in place (i.e. prevented from moving outwardly) by exteriorly projecting lip **19**. Coupling trim member **18** and body member **12** may involve resiliently deforming trim member **18** and/or body member **12** to form a "snap together" fit, wherein trim member **18** is securely but removably coupled to body member **12**.

[0063] Advantageously, trim member **18** may be coupled to body member **12** after body member **12** is already mounted to building surface **20**. As discussed above, fasteners may project through apertures **40** and/or other portions of mounting flange **38** and into building surface **20**. When trim member **18** is coupled to body member **12**, trim member channel **98** provides room for the heads (or the other parts) of the fasteners, which may extend outwardly from mounting flange **38**. In this manner, trim member **18** covers the fasteners used to mount vent **10**, providing vent **10** with a more aesthetically pleasing appearance and providing some protection for the fasteners.

[0064] Those skilled in the art will appreciate that interiorly projecting lip **17** and exteriorly projecting lip **19** represent only one of many possible ways in which trim member **18** may be coupled to body member **12**. One possible alternative embodiment is shown in Figures 11A and 11B, which respectively depict an alternative trim member **18** and an alternative body member **12**. In the embodiment of Figures 11A and 11B, the exterior surface of bent portion **88** comprises a plurality of projections **90** at spaced-apart locations around its perimeter. Inwardly extending portion **92** of trim member **18** comprises a corresponding groove **94** on its interior surface. Trim member **18** is preferably resiliently deformable such that it may be pushed inwardly over body portion **12** and projections **90** may be received in groove **94** to form a "snap together" fit.

[0065] In still other embodiments, trim member **18** is coupled to body member **12** by other means, such as by threadable coupling(s) and/or other types of deformable grooves, projections, indents and/or surfaces, for example. Inwardly extending portion **92** and/or flange portion **96** of trim member **18** may be coupled to an outward end of first flange **30**, to bent portion **88** and/or to mounting flange **38** of body member **12**. As discussed above, first flange **30**, bent portion **88** and mounting flange **38** may have different shapes and/or sizes. Similarly,

trim member **18** may have different shapes and/or sizes to facilitate coupling to various components of vent **10**.

[0066] In the embodiment illustrated in Figures 1-10, exteriorly extending head **58** of adjustment member **14** has a contoured shape comprising an outwardly projecting central portion **64**, an intermediate portion **62** and an exterior portion **68** (see Figure 5). Outwardly projecting central portion **64** (or other portions of head **58**) may optionally comprise grooves **66**, which may help users to rotate adjustment member **14** by providing a place where users may engage a tool, their hands and/or their fingers to rotate adjustment member **14**. In other embodiments, grooves **66** may be replaced and/or augmented with outwardly projecting tabs and/or indents having different shapes. In the illustrated embodiment, intermediate portion **62** extends sharply inwardly from central portion **64** in region **62A** and then extends gradually outwardly and exteriorly in region **62B** until it reaches exterior portion **68**. Exterior portion **68** extends even more gradually outwardly as it extends exteriorly from intermediate portion **62**.

[0067] In the embodiment illustrated in Figures 1-10, intermediate member **16** also comprises a second intermediate flange **72** which extends generally exteriorly from inwardly extending first intermediate flange **70**. Preferably, second intermediate flange **72** extends exteriorly at least as far as an interior edge of first flange **30** of body member **12**. As shown best in Figure 10, when intermediate member **16** is adjusted to an inward position, an exterior portion of second intermediate flange **72** contacts an outward surface of bent portion **88** of body member **12**. When second intermediate flange **72** contacts the outward surface of bent portion **88**, opening **86** (Figure 1A) is substantially closed and only a minimal amount of air flow is permitted between second intermediate flange **72** and bent portion **88**. In other embodiments, second intermediate flange **72** may be sized and/or shaped such that when intermediate member **16** is adjusted to an inward position, an exterior

portion of second intermediate flange **72** contacts one or more of: first flange **30** of body member **12**, bent portion **88** of body member **12**, mounting flange **38** of body member **12** and/or flange portion **96** of trim member **18**.

[0068] In embodiments comprising optional intermediate member **16**, head **58** of adjustment member **14** is preferably sized such that it extends in the exterior direction at least as far as an interior edge of second intermediate flange **72**. When adjustment member **14** is adjusted to an inward position relative to intermediate member **16**, the exterior portion **68** and/or the intermediate portion **62B** of head **58** contacts an outward surface of second intermediate flange **72**, such that opening **84** (Figure 1A) is substantially closed and only a minimal amount of air flow is permitted between head **58** of adjustment member **14** and second intermediate flange **72** of intermediate member **16**.

[0069] Accordingly, in the embodiment illustrated in Figures 1-10, vent **10** can be adjusted from a minimum air flow configuration by rotating adjustment member **14** to an inward position, where head **58** of adjustment member **14** abuts against second intermediate flange **72** of intermediate member **16**, and by rotating intermediate member **16** to an inward position, where second intermediate flange **72** abuts against bent portion **88** of body member **12**. If air flow is desired, then adjustment member **14** may be rotated, such that head **58** of adjustment member **14** moves outwardly relative to second intermediate flange **72** to permit air flow into and out of intermediate vent passageway **74** and vent passageway **32** through opening **84**. Adjustment member **14** may be rotated to move inwardly or outwardly to control the size of opening **84**. If more air flow is desired, then adjustment member **14** and intermediate member **16** may be rotated together relative to body member **12**, such that second intermediate flange **72** moves outwardly relative to bent portion **88** to permit air flow into and out of vent passageway **32** through opening **86**. Thereafter, the air flow may be controlled by

rotating adjustment member **14**, intermediate member **16** and/or body member **12** relative to one another as discussed above to control the size of openings **84**, **86**.

[0070] In preferred embodiments of the invention, the components of vent **10** (including body member **12**, adjustment member **14**, optional intermediate member **16** and optional trim member **18**) are fabricated from plastic. These plastic components of vent **10** may be injection molded using one or more molds. In alternative embodiments, one or more of the components of vent **10** or parts of the components of vent **10** are fabricated from other suitable materials, such as aluminum, steel or other metals, for example. In addition, the components of vent **10** may be fabricated using techniques other than injection molding, such as blow molding, rotational molding, spin casting and/or conventional machining techniques, for example.

[0071] As will be apparent to those skilled in the art in the light of the foregoing disclosure, many alterations and modifications are possible in the practice of this invention without departing from the spirit or scope thereof. For example:

- In the embodiments illustrated in Figures 1-11B, collar passageway **47** (i.e. the interior surface of collar **44**) is circular in cross-section and comprises threads **48** to define a threaded bore **46**. With this configuration, adjustment member **14** may be threadably coupled to body member **12**. In general, only the interior surfaces of collar **44** is required to be circular in cross-section. In alternative embodiments, threaded bore **46** may be provided by a component of any shape, which is penetrated by a bore having a generally circular cross-section.
- In some embodiments, the interior surface of collar **44** is not threaded and contact portion(s) **55** of stem portions **53** engage the interior surface of collar **44** using other techniques, such as slidable frictional engagement. In such embodiments, the interior

surface of collar **44** may be, but need not be, circular in cross-section.

- Figure 12A is a partial schematic cross-sectional view of a collar **44** of body member **12** and stem portions **53A**, **53B** (collectively **53**) of adjustment member **14** according to an alternative vent embodiment. In the embodiment of Figure 12A, the interior surface of collar **44** is rectangular in cross-section. Stem portions **53** comprise contact portions **55A**, **55B**, **55C**, **55D** (collectively **55**) that slidably frictionally engage the interior surface of collar **44** at the corners thereof. The engagement between contact portions **55** and the interior surface of collar **44** permits adjustment member **14** to be slidably moved inwardly and outwardly relative to body member **12**. Figure 12B schematically depicts a partial cross-sectional view of a collar **44** of body member **12** and stem portion **53** of adjustment member **14** according to another alternative vent embodiment. In the embodiment of Figure 12B, the interior surface of collar **44** is rectangular in cross-section and comprises a pair of inwardly extending grooves **83A**, **83B**. Contact portions **55A**, **55B** of stem portion **53** are received in grooves **83A**, **83B** for slidable frictional engagement therewith to permit inward and outward movement of adjustment member **14** relative to body member **14**. The embodiments of Figure 12A and 12B are merely representative examples of slidable frictional engagement between adjustment member **14** and body member **12**. Those skilled in the art will appreciate that slidable frictional engagement between adjustment member **14** and body member **12** may be provided by a variety of alternative configurations of stem portions **53** and collars **44**. For example, collar **44** may be circular in cross-section and still facilitate slidable friction engagement. In another example, contact portions **55** of stem portions **53** may comprise inwardly extending grooves which receive corresponding

projections from the interior surface of collar **44** and still facilitate slidable frictional engagement.

- In the embodiment illustrated in Figures 1-10, collar **44** is located in vent passageway **32**. In general, brackets **42** may extend inwardly or outwardly such that collar **44** is not located in vent passageway **32**.
- In the embodiment illustrated in Figures 1-10, stem portions **53** comprise blades **50** which extend radially outwardly and which comprise contact portions **55** at their exterior ends for engaging the interior surface of collar **44** at angularly spaced-apart locations. This configuration is not generally necessary. Figures 12C-12H show non-limiting examples of partial cross-sectional views of stem portion(s) **53** of adjustment member **14** and collar **44** of body member **12** according to other possible embodiments. In each case, stem portion(s) **53** define one or more collar openings **51** on the interior surface of collar **44** (i.e. in collar passageway **47**) . Stem portion(s) **53** may define collar opening(s) **51** between two or more stem portions **53** and/or between one or more stem portions **53** and the interior surface of collar **44**. In each case, stem portion(s) **53** comprise one or more contact portions **55** which adjustably engage the interior surface of collar **44**. However, it is not necessary that there be a one to one correspondence between stem portions **53** and contact portions **55**. In some embodiments, one or more stem portions **53** do not have a contact portion **55**. In some embodiments, a single stem portion **53** may have a plurality of contact portions **55**. The engagement between contact portions **55** and the interior surface of collar **44** may comprise threadable engagement, slidable frictional engagement or other forms of adjustable engagement. Those skilled in the art will appreciate that the embodiments shown in Figures 12C-12H are merely representative examples and that many other different configurations of stem portions **53** and collars **44** are possible.

- Some alternative embodiments lack a separate collar **44**. In such embodiments, stem portions **53** of adjustment member **14** may engage the interior surface of first flange **30**.
- All of the alternative embodiments and variations of collar **44** and stem portions **53** described above may also be applied to intermediate member collar **78**.
- In some embodiments, vent **10** comprises more than one intermediate member **16**. Each intermediate member **16** is coupled between adjustment member **14** and body member **12** in substantially the same manner as in the above-described embodiment having one intermediate member.
- In some embodiments, there is no need for trim member **18**. For example, fasteners used to mount vent **10** to building surface **20** may be left uncovered. In an alternative example, body member **12** may be designed to receive fastener covering plugs in specific locations, such that fasteners may project through mounting flange **38** and then subsequently be covered by such plugs.
- The embodiments described above describe the flow of air through vent **10**. Those skilled in the art will appreciate that other fluids may flow through vent **10** and that solid and/or liquid matter may be suspended in air (or other fluids) that flow through vent **10**.

[0072] Accordingly, the scope of the invention is to be construed in accordance with the substance defined by the following claims.